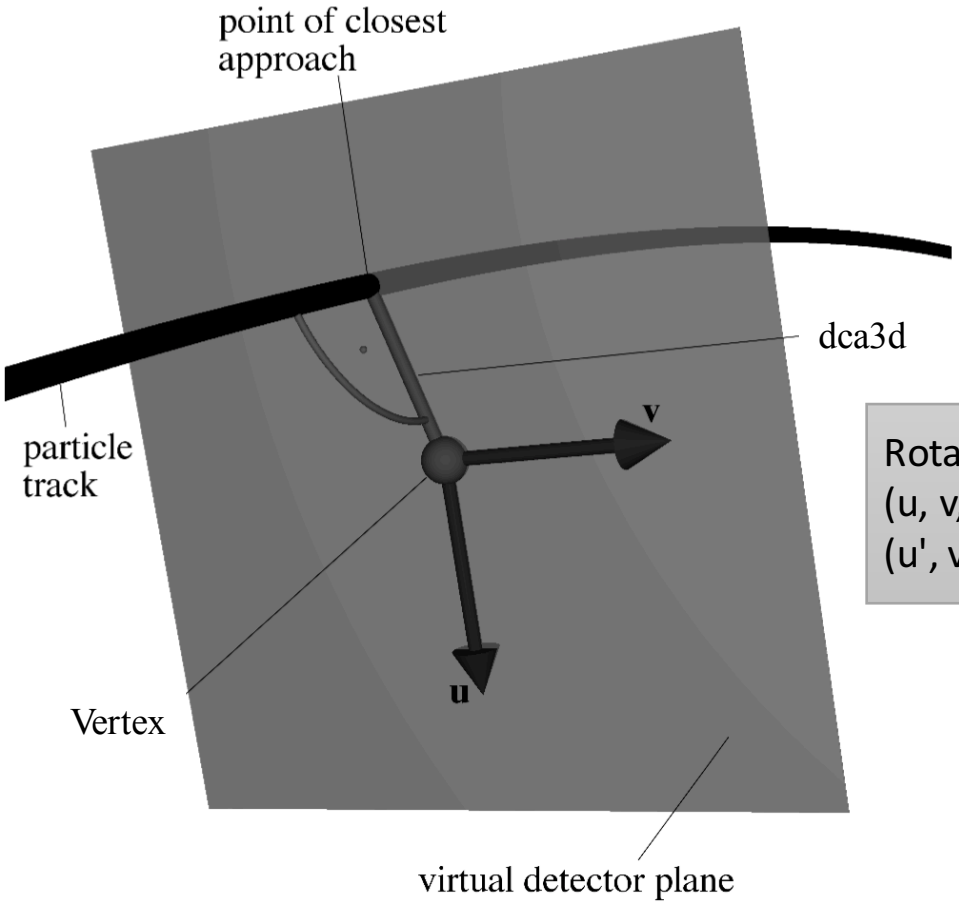
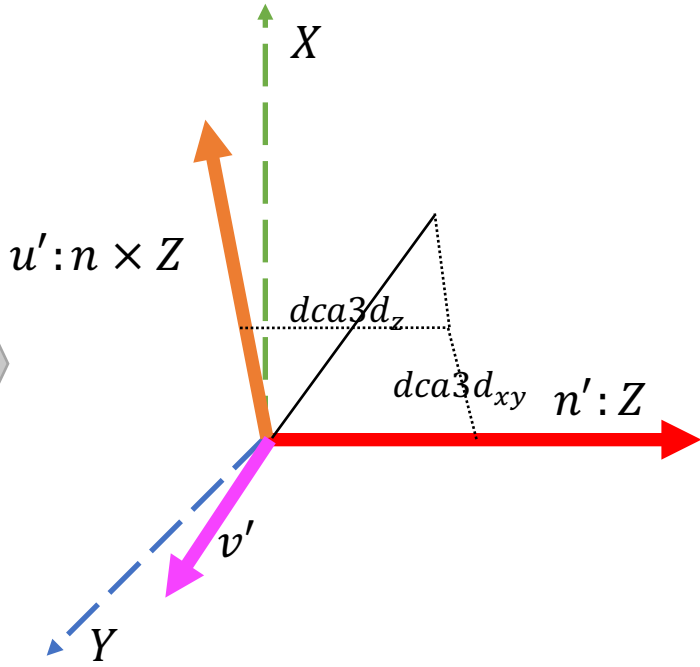
DCA3d

Jin Huang(BNL), Haiwang Yu (NMSU)

dca3d



Rotation:
(u, v, n) ⟹
(u', v', n')



Verify the rotation:

40 GeV muon, mom = (0, 40, 0) GeV, along Y-axis, from vertex(0,0,0)
Under this setup, (u',v', n') will be aligned with (X,Y,Z), such I can compare my calculation with GenFit calculated 6D pos-mom cov. matrix that defined in the lab (X,Y,Z) frame:

My calculation:
3D pos cov. matrix:

3x3 matrix is as follows

X, Y, Z	0	1	2
0	7.666e-07	1.731e-11	3.588e-11
1	1.731e-11	4.203e-08	-1.449e-07
2	3.588e-11	-1.449e-07	4.995e-07

GenFit calculation:
6D pos-mom cov. matrix:

6x6 matrix is as follows

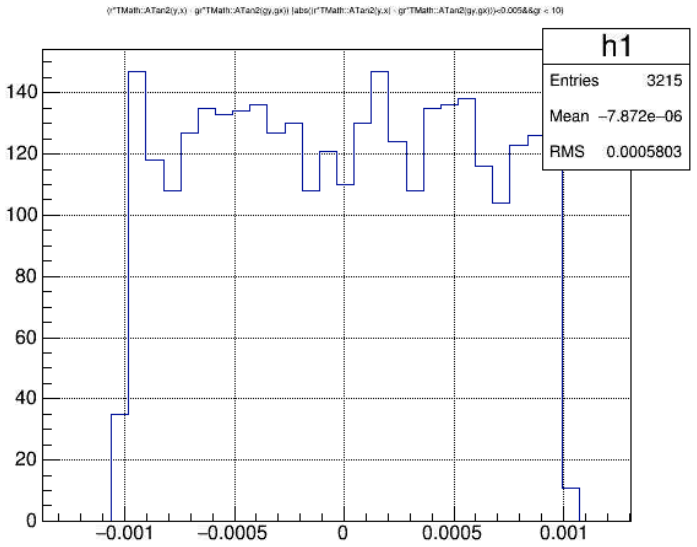
X, Y, Z	0	1	2	3	4	5
0	7.666e-07	1.956e-11	2.808e-11	-3.168e-06	0.0007328	0.0002126
1	1.956e-11	4.203e-08	-1.449e-07	-1.487e-10	-1.244e-08	3.783e-07
2	2.808e-11	-1.449e-07	4.995e-07	1.181e-10	1.342e-07	-1.278e-06
3	-3.168e-06	-1.487e-10	1.181e-10	2.986e-05	-0.007382	-0.002141
4	0.0007328	-1.244e-08	1.342e-07	-0.007382	2.287	0.6634
5	0.0002126	3.783e-07	-1.278e-06	-0.002141	0.6634	0.1925

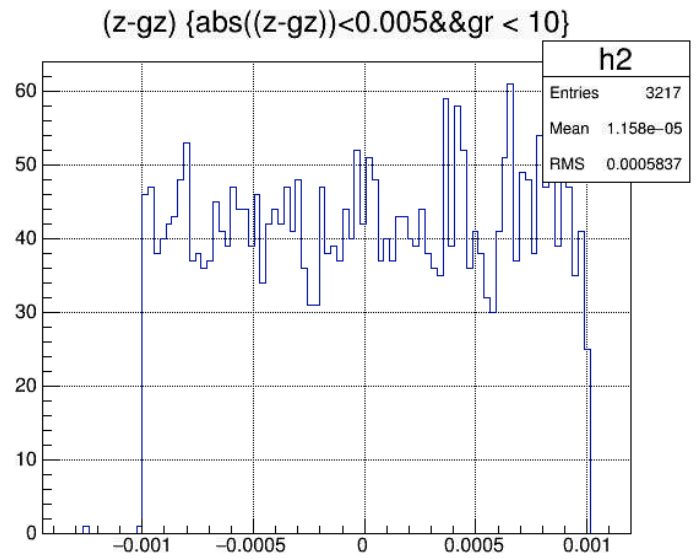
MAPS clustering

Under this setup:
40 GeV muon, mom = (0, 40, 0) GeV, along Y-axis, from vertex(0,0,0)
Tuned the MAPS clustering errors to make the dca pulls' sigma closer to 0:

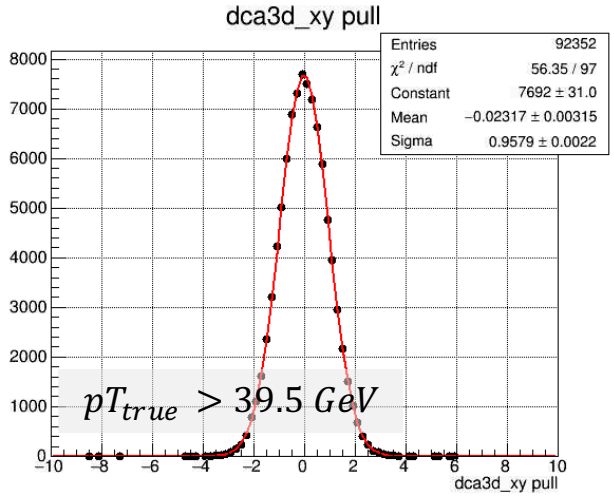
ephi := 2.0*phisize/sqrt(12)
ez := 2.0*zsize/sqrt(12)

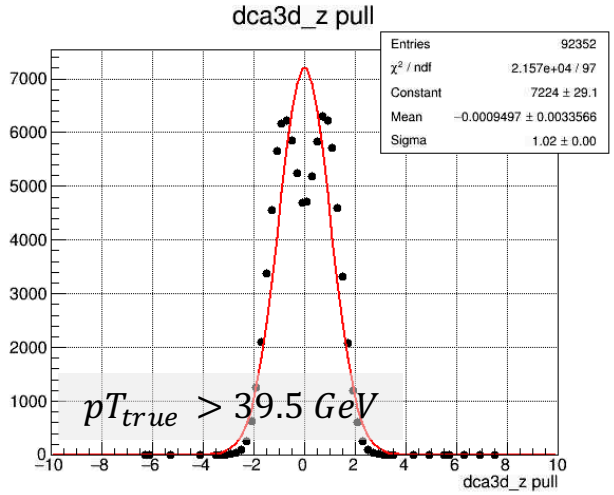
This won't affect Alan's code for that code used "size".



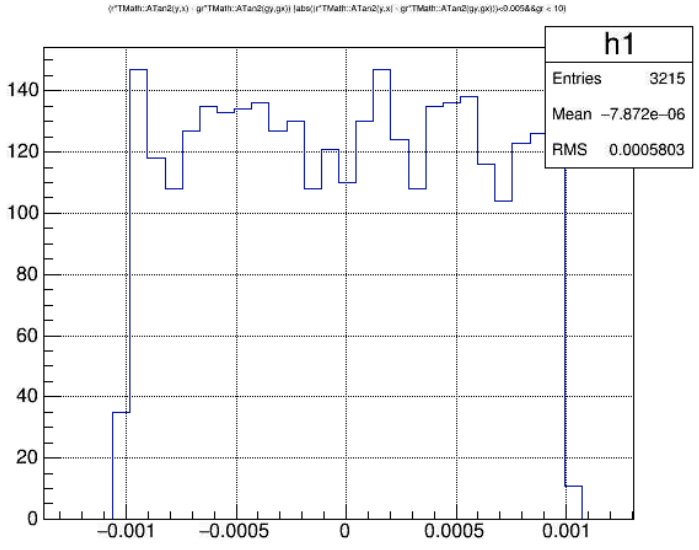


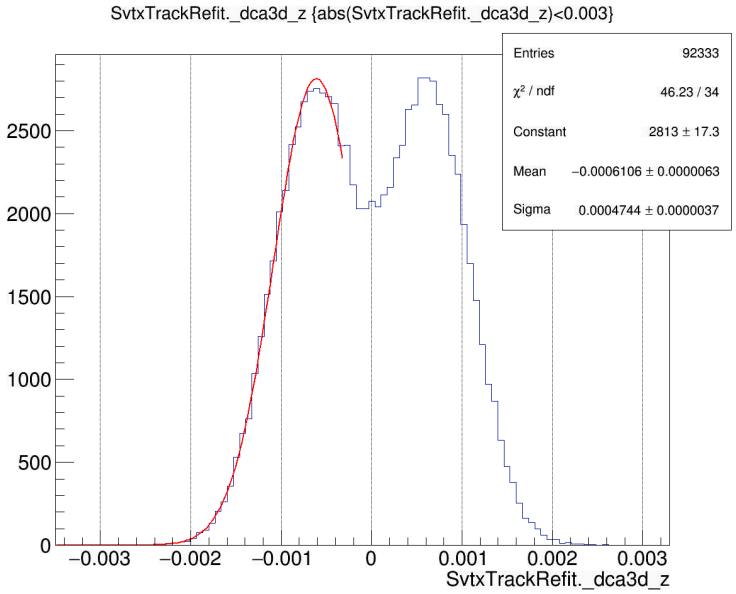
40GeV muon shot nearly along Y-axis, eta (-0.1,0.1); phi (0.49pi, 0.51pi), from vertex (0,0,0)cm

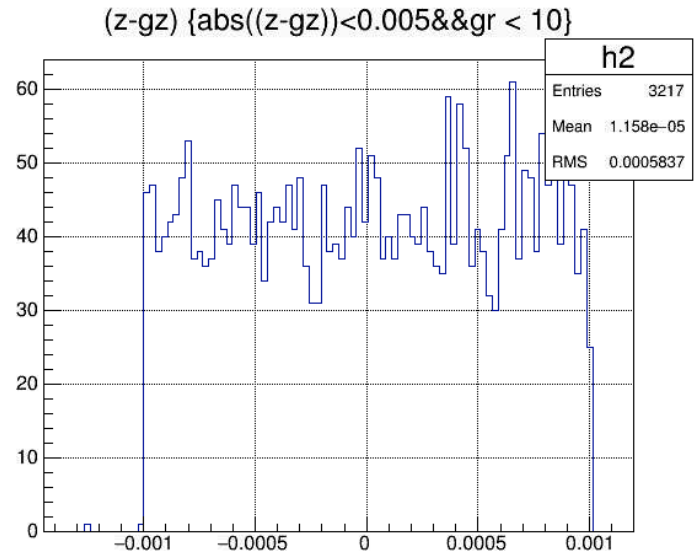


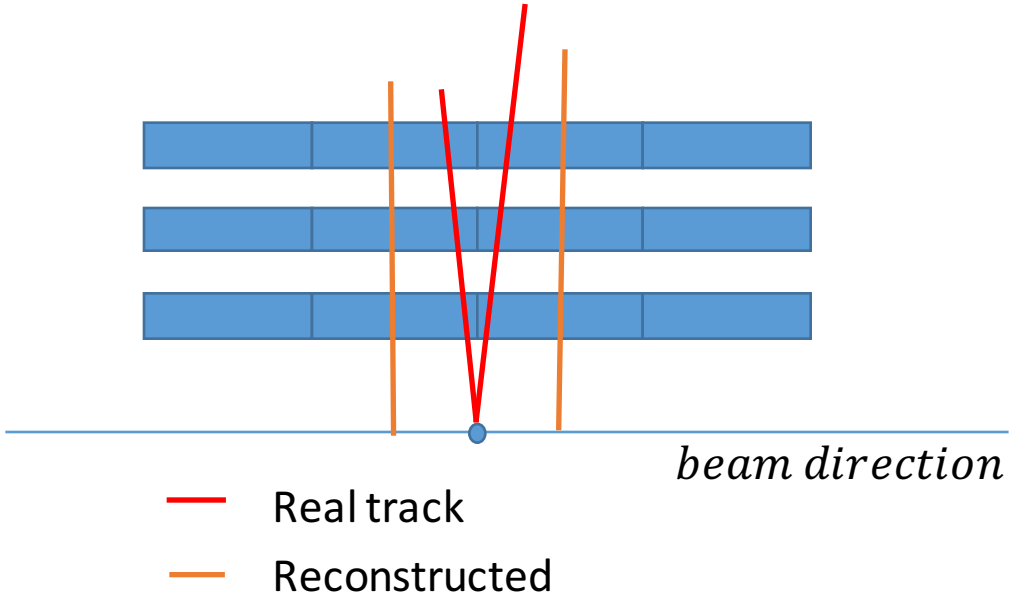


Understanding the double peak

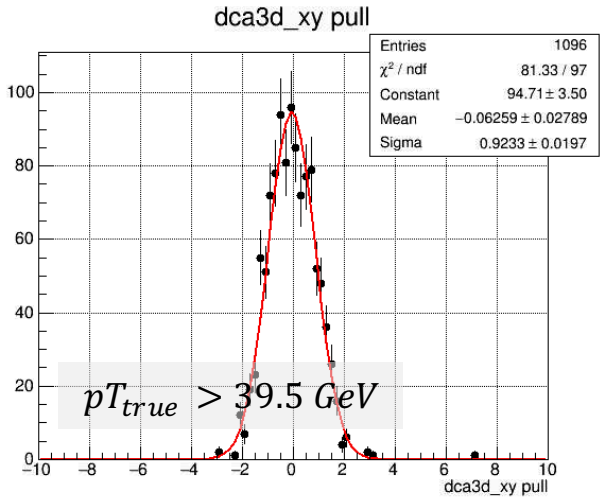


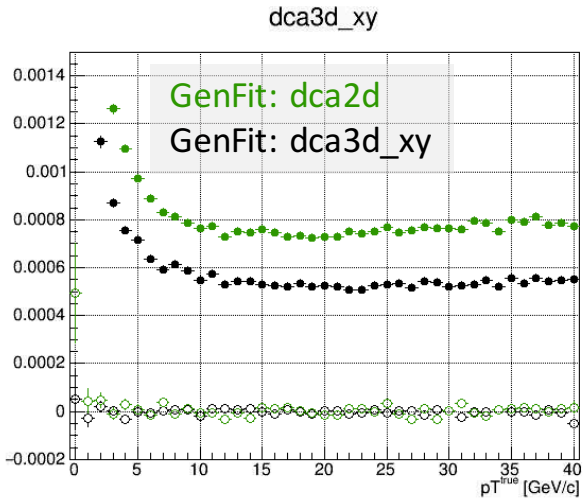


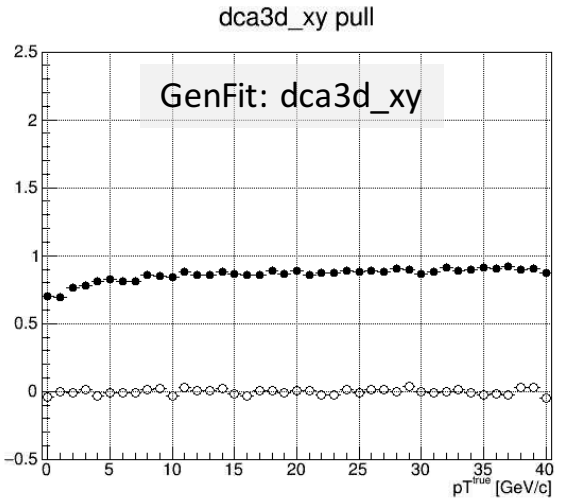


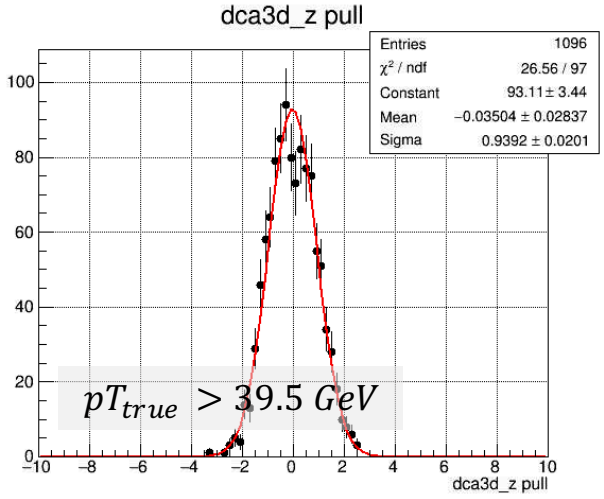


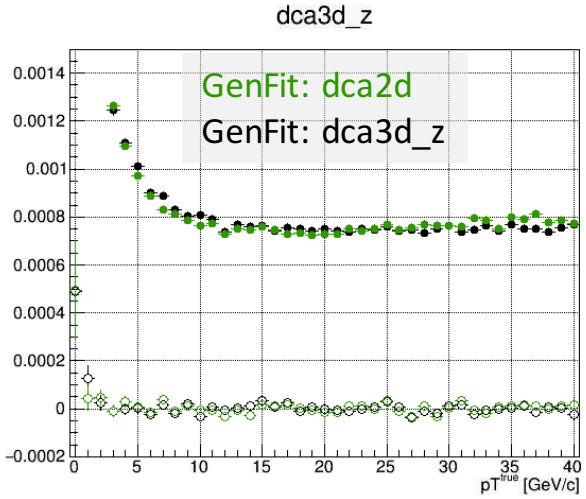
0-40GeV muon, eta(-5,5), phi(-pi, pi), from vertex (0,0,0)

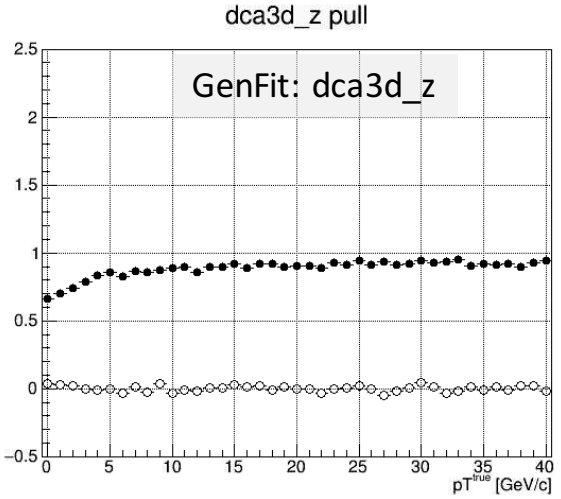












Plan

- Fine tuning the MAPS cluster errors according to more realistic setups?
  - Smeared vertex

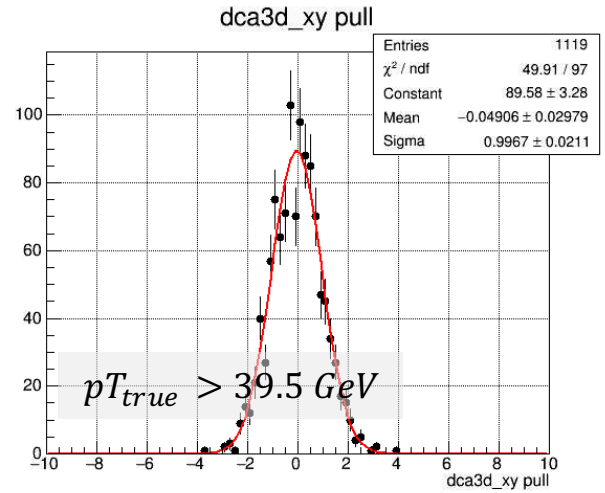
- Make pull request for these developments (today)
  - MAPS cluster uncertainty tunning
  - dca3d in SvtxTrack_v1
  - dca3d in PHG4TrackKalmanFitter
  - "get_charge()" exception handling in PHGenFit andPHG4TrackKalmanFitter

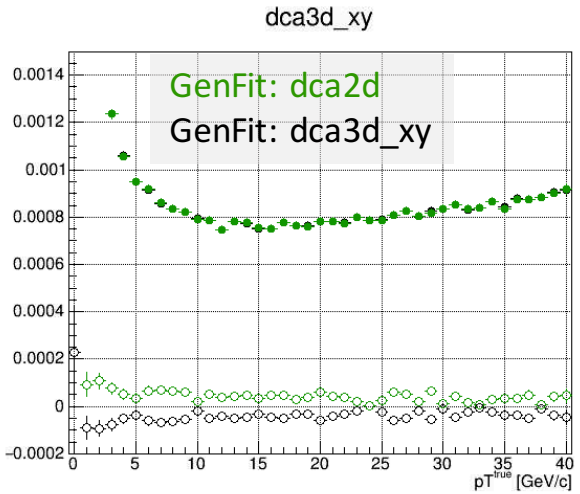
- Fix memory leaks in PHGenFit andPHG4TrackKalmanFitter, reported from Sanghoon (this week)
  - Another pull request

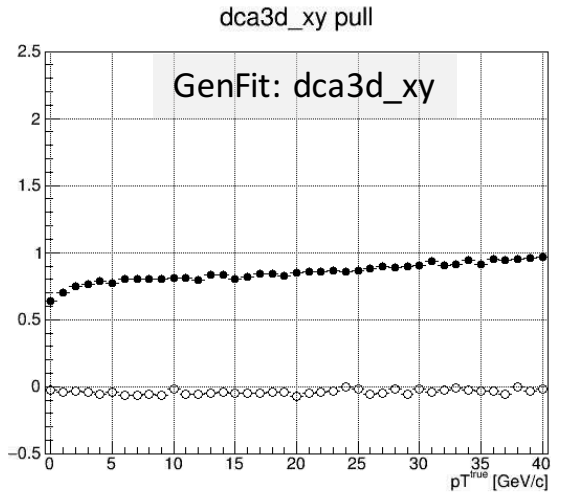
- HIJING simulation for B-jet tagging using the impact parameter method (next week)
  - Likelihood method

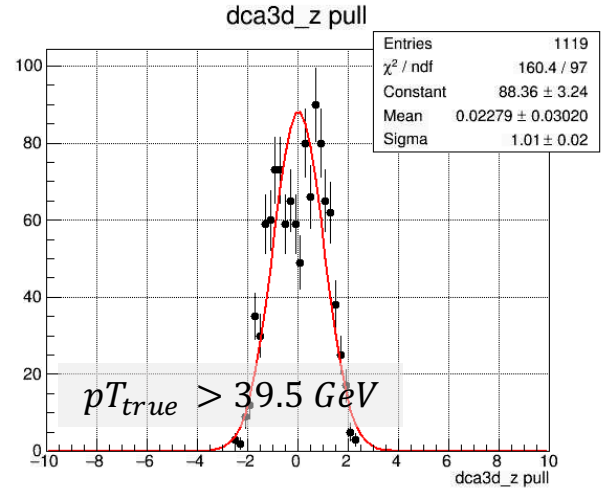
Backups:

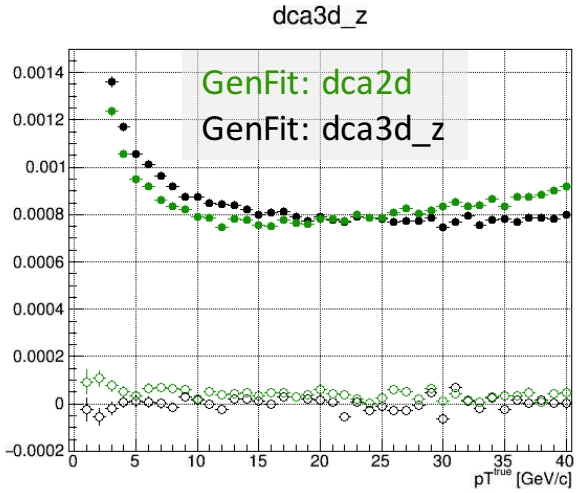
0-40GeV muon shot along Y-axis from (0,0,0)

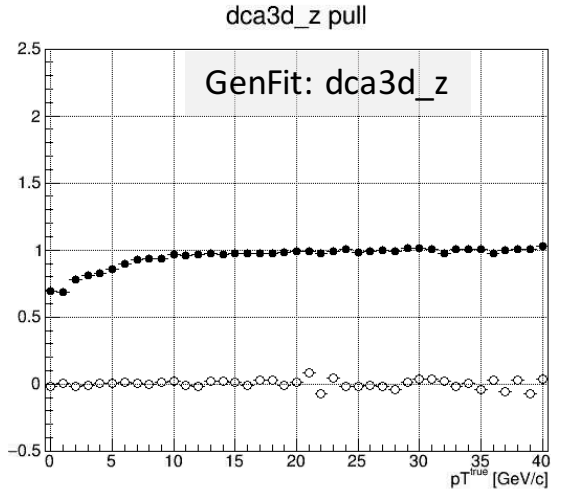




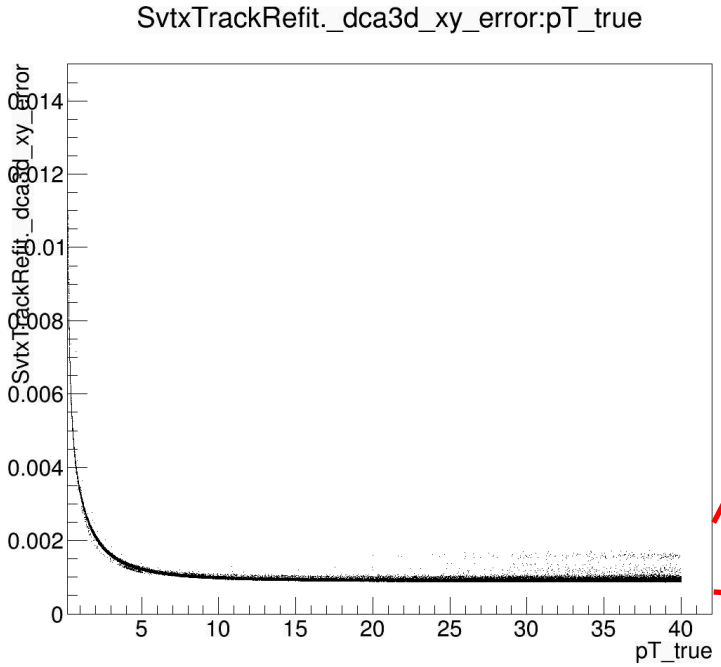


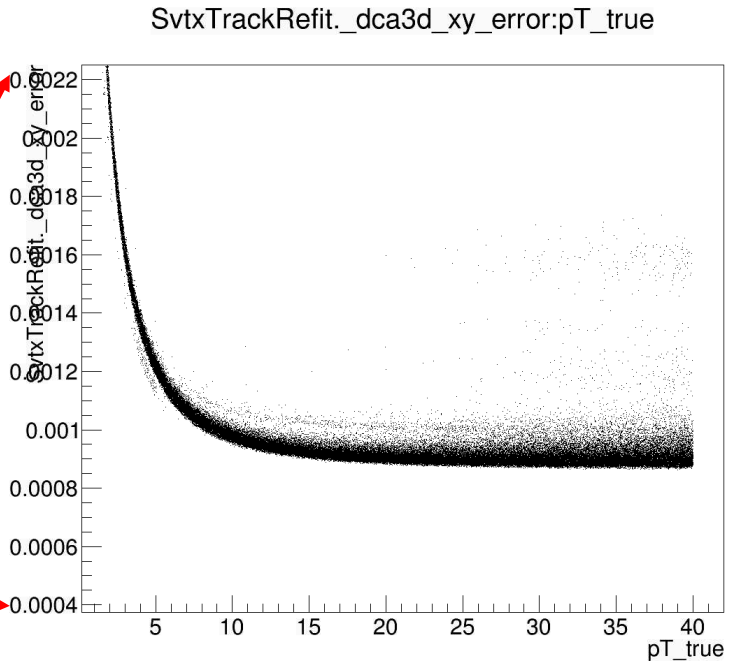


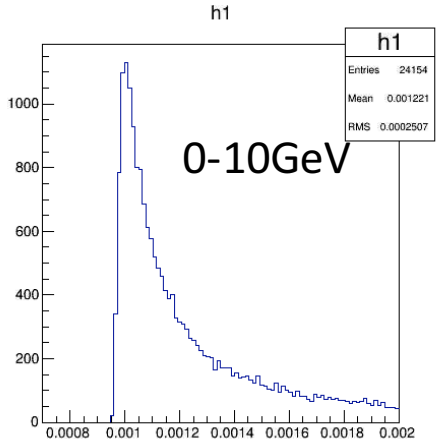


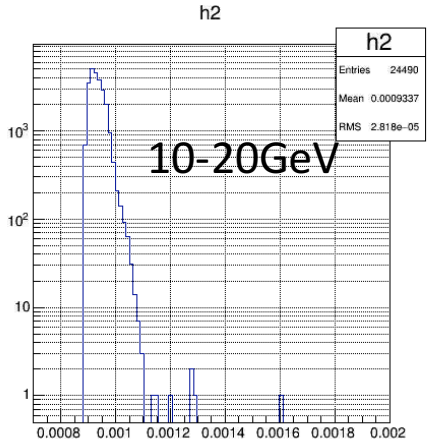


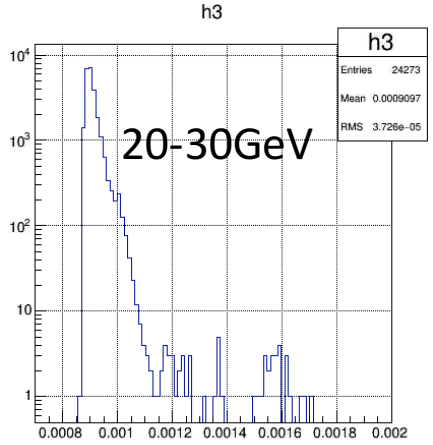
What dose GenFit think? dca3d_xy_error

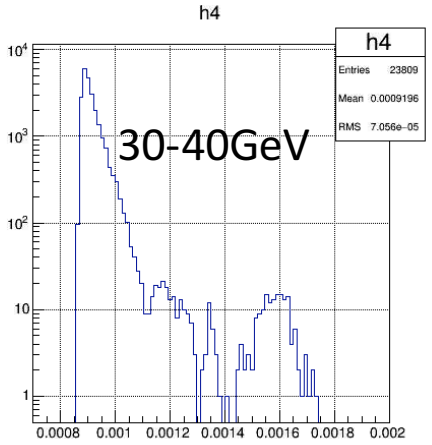
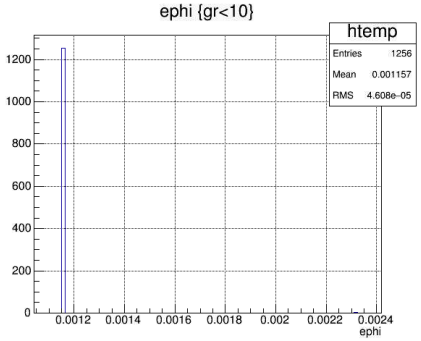
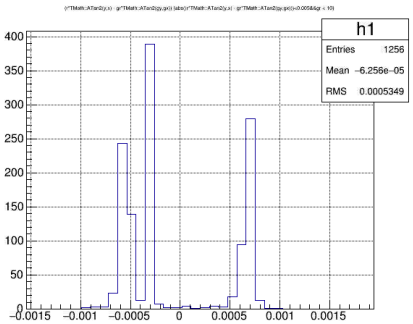
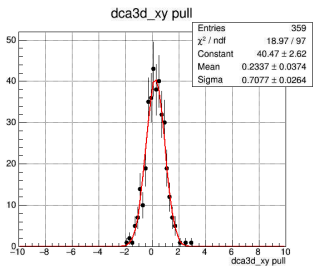
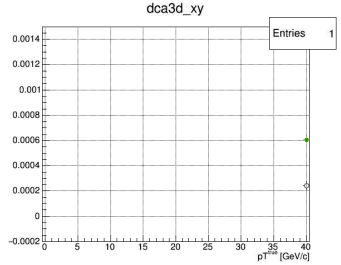
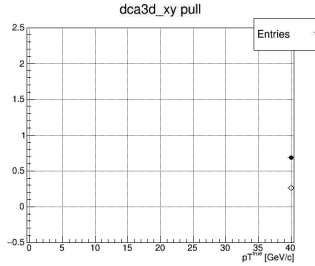
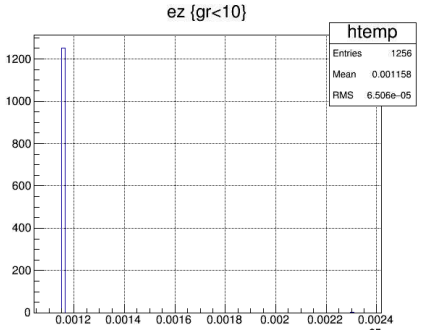
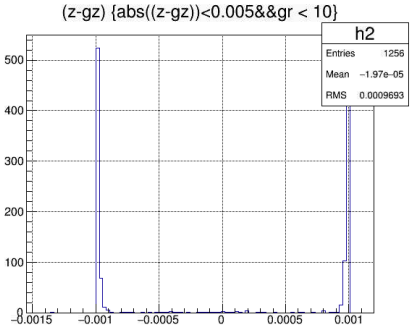
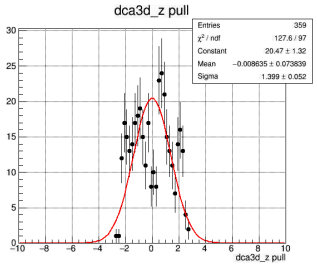
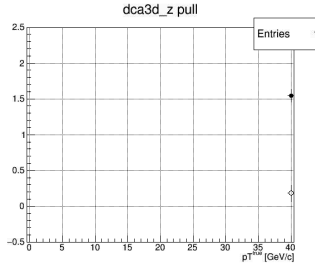












40GeV muon shot exactly along Y-axis